CANDIDATE NUMBER: _____/_____**(write in from your letter)**

EXAMINATION: MECHANICAL ENGINEER

EXAM PAPER: CME3 – Safety and mining legislation applicable to surface coal mines

DATE: Thursday, 25th November 2021 – 1:05pm to 3:45pm

EXAMINATION FOR CERTIFICATE OF COMPETENCE TO BE A MECHANICAL ENGINEER OF COAL MINES OTHER THAN UNDERGROUND MINES

Issued under the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*

INSTRUCTIONS TO CANDIDATES:

Unless otherwise stated all references to Act and Regulations are to the

Work Health and Safety Act 2011

Work Health and Safety Regulation 2017

Work Health and Safety (Mines and Petroleum Sites) Act 2013

Work Health and Safety (Mines and Petroleum Sites) Regulation 2014

10 minutes reading time is allowed prior to the start of the examination. Candidates can use a **highlighter only** to mark points of importance during the reading time, but may not begin answering the questions. You must NOT use any other writing item during the reading time such as a pen.

It is expected that candidates will present their answers in an engineering manner, making full use of diagrams, tables, and relevant schematics where applicable, and showing full workings in calculations. Consideration will be given when marking for **legibility in diagrams and handwriting**.

Provide answers in point form wherever appropriate. If you are unable to fit your answers in the available space use the three (3) blank pages included at the end of the paper. Ensure the question you are answering is clearly marked.
Electronic aids may not be used, apart from a non-programmable calculator.

All six (6) questions are to be attempted.

All questions are of equal value, but parts of questions may vary in value. The marks applicable to each part of a question will be indicated adjacent to the question.

This examination is a **closed book** examination – that is you cannot bring any reference material into the exam, such as copies of legislation. Reference material will be provided in the exam paper as applicable.

Place your identification number only, NOT your name, at the start of this paper at the commencement of the exam – that is after the reading time is over.

EXAMINATION BOOKLET

Question Number		Mark	Available mark	Marked by *Initials*	Summary comments to justify, as necessary
1	1		12		
	2		12		
	3		24		
	4		12		
	Total		60		
2	1		10		
	2		14		
	3		15		
	4		15		
	5		6		
	Total		60		
3	1		15		
	2		45		
	Total		60		
					Mechanical Practice
4	1		12		
	2		21		
	3		18		
	4		9		
	Total		60		

Question Number		Mark	Available mark	Marked by *Initials*	Summary comments to justify, as necessary
5	**1**		**10**		
	2		**12**		
	3		**20**		
	4		**10**		
	5		**8**		
	Total		**60**		
6	**1**		**15**		
	2		**10**		
	3		**12**		
	4		**12**		
	5		**11**		
	Total		**60**		
PAPER	**TOTAL**		**360**		*Marks checked by:*

If marking is reviewed under approved processes, then examiner is to record details**:**

Date	Examiner	Questions reviewed	Marks changed	Details/justification, as necessary
Eg. 2/8/19	**Andrew Palmer**	**All**	**Q1 – 4 (previously 5)**	**Found one more criteria**

LEGISLATION

Question 1 – Work Health and Safety (Mines and Petroleum Sites) Regulation 2014

(Total 60 marks)

Clause 26 Principal control plans

*(4) **Mechanical engineering control plan** The operator of a mine or petroleum site at which there is a risk to health and safety associated with the mechanical aspects of plant and structures at the mine or petroleum site—*

1. When considering WHS(MPS) Regulation Clause 26 (4) with respect to a surface coal operation what are the requirements? (12 marks)

	/12

Schedule 2 (2) Mechanical engineering control plan

(1) The operator of a mine or petroleum site must, in preparing a mechanical engineering control plan, take the following into account in determining the means by which the operator will manage the risks to health and safety from the mechanical aspects of plant and structures at the mine or petroleum site—

2. What are the four (4) aspects referred to in this clause? (12 marks)

/12

3. For each of the four aspects identified above list three safety management system documents that would be developed to specifically manage the aspect, such as the mines broad brush risk assessment. You cannot list a document more than once. (24 marks)

/24

Schedule 10 Statutory functions at mines

4. According to Clause 21 what are the functions of the Mechanical Engineer? (12 marks)

	/12

Question 2 – Work Health and Safety (Mines and Petroleum Sites) Regulation 2014
(Total 60 marks)

Principal Mining Hazards

There is a risk of fatalities and serious injury in all parts of the mining sector that requires everyone to be vigilant and proactive in meeting their responsibilities. Learning from experience, preventing devastating reoccurrences, and improving the health and safety of all people working in the industry is a profound way of acknowledging and recognising all those that have been affected by mining safety incidents throughout history.

1. In Clause 5 what is the meaning of Principal Mining Hazards? (10 marks)

	/10

2. List the seven (7) of the ten Principal Mining Hazards identified in Clause 5 (14 marks)

	/14

WHS(MPS) Regulations Schedule 1 Part 2 Clause 4 Roads or other vehicle operating areas

The following matters must be considered in developing the control measures to manage the risks of roads or other vehicle operating areas—

a) mobile plant characteristics, including …..

b) the effect on road conditions of expected environmental conditions during operating periods (including time of day, weather, temperature and visibility),

c) the impact of road design and characteristics, including grade, camber, surface, radius of curves and intersections,

d) the impact of mine design, including banks and steep drops adjacent to vehicle operating areas,

e) the volume and speed of traffic and the potential for interactions between mobile plant with different operating characteristics, including heavy and light vehicles,

f) the potential for interactions between mobile plant and pedestrians, including consideration of park up areas and driver access,

g) the potential for interaction between mobile plant and public traffic,

h) the potential for interaction between mobile plant and fixed structures, including overhead and underground power lines, tunnel walls and roofs.

3. With respect to Clause 4 (a) what matters does the legislation requires you to consider in relation to mobile plant characteristics? List five (5) of the six items. (15 marks)

/15

4. For one of the matters identified above detail three (3) controls, specific to that mobile plant characteristic, that you would implement to manage the risks associated with it. (15 marks)

/15

5. When considering the requirements of 4 (e) to (h) list three (3) controls you would implement at your mine to mitigate the potential for vehicle collision. (6 marks)

	/6

Question 3 – Work Health and Safety Act 2011 **(Total 60 marks)**

1. The legislative framework identifies a number of individual positions and groups who have a defined responsibility for safety on mine sites. Identify three (3) of these individual positions or groups. (15 marks)

	/15

2. Each of the individual positions or groups you have identified above have specified duties and obligations under legislation. Using dot points list the legislative duties of each one. (45 marks)

/45

MECHANICAL PRACTICE

Question 4 – Contractor management **(60 marks)**

You are the Mechanical Engineer of a large open cut mine. The mine plan has a scheduled major overhaul of an 800 tonne excavator at the on site shutdown pad commencing in 2 months. The successful contractor is responsible for managing the shutdown works over a 4 week period. You have been tasked with reviewing and approving the contractor management plan for the shutdown.

1. In the project detail summary what are six (6) significant project details you would expect to be included in the signed contract? (12 marks)

	/ 12

2. The project scope of work implementation plan will identify how the Contractor intends to manage issues regarding risk, location, labour, equipment, emergencies, etc. List twenty one (21) items you want to see specifically identified and managed in the contract in relation to the scope of works implementation plan? (21 marks)

3. List six (6) systems of work, such as management plans or standards of engineering practice, that you expect to be included in the contract to manage the contracted works?

(18 marks)

/ 18

4. Identify three (3) mechanisms you would implement to measure, monitor and review the works under contract? (9 marks)

/ 9

Question 5 – Hot work management plan **(60 marks)**

Your mine has been reviewing its five year plan, and identified the need to start routinely performing hot work on site in the near future. As Mechanical Engineer you are nominated to develop a hot work management plan for the site.

1. What are five (5) major steps you will go through to develop the HWMP (10 marks)

	/ 10

2. List six (6) highly relevant reference documents and / or standards you will refer to in the development of the HWMP (12 marks)

	/ 12

3. List ten (10) hazards you will consider associated with the process of thermal lancing (20 marks)

	/ 20

4. List five (5) pre use / daily inspections required for an electric MIG welder (10 marks)

	/ 10

5. List four (4) pre use / daily inspections required for an oxy acetylene set (8 marks)

	/ 8

Question 6 – Excavator bucket overhaul (60 marks)

You are the Mechanical Engineer of a large open cut mine. As with the previous question a major equipment shutdown is planned for an 800 tonne excavator commencing in 2 months.

Part of the 4 week shutdown scope involves an Engineering firm being awarded the boilermaking contract responsible for managing the bucket overhaul on site, involving crack repairs and wear package replacement. You are aware of the 2017 fatality of a boilermaker in Queensland, where during the process of removing the wear plate, it elastically sprung-back and fatally struck him. Similar work is being conducted at your shutdown, and you have been asked to review and approve the boiler making contractors risk management plan for the shutdown.

1. Describe three (3) reasons why elastic spring-back may occur in wear plates. (15 marks)

/ 15

2. Identify five (5) major hazards involved in the removal of worn wear plates and the dogging down and welding of the new wear plate. (10 marks)

/ 10

3. List four (4) job specific requirements you would expect to see in a letter from the Contracting company relating to the personnel who will be performing the work.

(12 marks)

	/ 12

4. List five (5) types of job specific plant you would expect the Contractor to include on their introduction to site requirements (12 marks)

	/ 12

5. What job specific controls would you expect to see in the Contractors risk assessment to alleviate the hazards involving elastic spring-back for both removing worn wear plates and dogging down new plates on the bucket? (11 marks)

	/ 11

END OF QUESTIONS

BLANK PAPER TO WRITE ANSWERS THAT YOU COULD NOT FIT INTO THE SPACE PROVIDED – INDICATE QUESTION NUMBER AT START OF ANSWER

END OF PAPER